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Entering the Terra Incognita between Biochemistry and Cytology

Putting New Research Tools to Work in the 1940s

> In recent years, the construction of a bridge between these two levels of knowledge has been initiated. This has been due to the adaptation and employment in biology of techniques derived from physics and chemistry and to the breaking down of the barriers which previously separated these sciences. Below the structure visible to the microscope there exists a true organization of molecules and micelles in the different phases of the system which constitute protoplasm.
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> (de Robertis et al., 1949, p. 64).

New research tools, especially cell fractionation and electron microscopy, opened for investigation the uncharted territory between biochemistry and cytology. The goal was to explain how cells carry out their basic functions. In the nineteenth and early twentieth century, the activity that had received the most attention was cell reproduction. The basic operations in cell division, including those carried out by chromosomes in the nucleus, had been described by cytologists using stains and the apochromatic lens decades before the advent of cell biology. The focus of early cell biology was rather on functions performed in the cytoplasm, especially capturing energy and synthesizing proteins. The first important steps in developing mechanistic explanations of these functions was to identify the mitochondrion and the endoplasmic reticulum as the cell organelles responsible for each, a project largely accomplished in the 1940s (although the name *endoplasmic reticulum* was not introduced until the early 1950s).

One laboratory at the Rockefeller Institute, in which Albert Claude, Keith Porter, George Palade, and others performed pioneering research, played the pivotal role in establishing these structure–function linkages. As we will see, understanding cell function was not the initial objective of research in this laboratory, and it was only at the end of the 1940s that it officially became